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THE SUGAR CANE INDUSTRY

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The sugar cane industry constitutes one of the staple agricultural resources of the southern Gulf States. Not only this region but all of the southern states are under the financial and economic tension of phenomenal industrial growth and evolution. This is having the effect of diversifying production and enlarging the facilities for distribution. The construction operations of the cities and towns rival in vigor the cultivation operations of the country, and the rush is on for the vantage ground between domestic and visiting capital. Obviously, the situation is peculiarly interesting both to the combatant and to the onlooker. We shall hope to inspire some interest in the consideration of the position sugar cane is to hold in the economic struggle.

Experimental Stage

Although commerce is an impartial master, with a keen perception of the most profitable, the industry of long establishment possesses certain advantages of priority which make supplanting more difficult than in the case of new industries. The exact date of the introduction of sugar cane into the American colonies cannot be affirmed with accuracy, but the plants were grown successfully in Georgia and Louisiana prior to 1760. The cultivation was discouraged by the parent governments in favor of its more profitable cultivation on the islands of the Atlantic, and the early experimenters experienced great difficulty in obtaining sugar from the extracted cane juice. In 1791 Don Antonio Mendez imported a sugar maker from Cuba, and successfully converted his crop of that year into sugar. Etienne de Bore purchased cane from Mendez, and began to plant on a larger scale than had yet been attempted. In 1794 he sold the sugar from his crop for \$12,000, which excited the hopes of the struggling settlers of Louisiana more than if a

bonanza diamond mine had been discovered. At this time only the creole variety was in cultivation, and it was not suited to the soil and climate of the Gulf coast. The Tahiti variety was introduced from St. Domingo in 1797, but it proved little better than the creole. During the succeeding years sugar houses increased in number in Georgia and Louisiana, but not rapidly, since the varieties were so ill-adapted as to make indigo, rice and cotton successful competing crops. The industry was greatly depressed by the war of 1812, and, fortunately for the sugar industry in America, the purple and striped varieties from Java were introduced into Georgia in 1814. It remained for Louisiana to utilize the valuable acquisition, which began with the introduction of the purple or ribbon cane into that state in 1820, by John Coiron. The industry now passed from a stage of doubtful perpetuation to that of economic and commercial establishment. As in the case of all industries of manufacture, it has been, and is, subject to periods of revival and decline. From 1830 to 1835 the cultivation declined in Georgia and Florida on account of the advance in the price of cotton and rice, and the decline in the price of sugar; but the cane crop had gained a headway in Louisiana which made it less responsive to minor fluctuations on the market.

The successful utilization of slave labor in the cultivation of the crop was a significant factor in the development of the sugar industry in Louisiana. By 1828 slave labor was producing more than half of the world's sugar, and practically all of the Louisiana output. The production in Louisiana increased rapidly, reaching 177,000 tons in 1855, which made it not only the largest, but the chief source of revenue.

That the Civil War paralyzed this and all other southern industries, is so well known as not to need amplifying. The total production in 1865 was scarcely 5,000 tons, and the sugar industry was rehabilitated very slowly and against great odds, as evidenced by the production in 1875 only aggregating 60,000 tons. Twenty-five years elapsed, following the closing year of the war, until it regained the status of 1860. Not only was the labor supply in the person of the freed Negroes so thoroughly disorganized as to be almost worthless, but the sensational advance in the price of cotton set the whole gulf coast aflame with a cotton growing boom. The cane industry had to establish itself on different economic lines,

TABLE I.
RELATIVE STATUS OF THE SOUTHERN STATES IN THE PRODUCTION OF SUGAR CANE, 1850-1908.

STATES	1850		1870		1890			1900			1907-8		
	Sugar in Tons (2200lbs.)	Molasses and Syrup in Gallons	Sugar in Tons (2200lbs.)	Molasses and Syrup in Gallons	Sugar in Tons (2200lbs.)	Molasses and Syrup in Gallons	Acreage	Sugar in Tons (2200lbs.)	Molasses and Syrup in Gallons	Acreage	Sugar in Tons (2200lbs.)	Molasses and Syrup in Gallons	Acreage
Louisiana.....	102,727	10,931,177	36,684	4,585,150	132,774	14,341,081	193,694	145,075	14,184,733	276,966	335,000	.....	.....
Texas.....	3,341	441,638	918	246,062	2,491	2,159,339	16,284	1,267	987,587	17,851	11,818	.....	.....
Florida.....	1,250	352,893	432	344,339	769	1,441,744	9,345	129	1,687,452	13,800	3	2,398,000	7,307
Georgia.....	746	216,150	292	553,192	594	3,223,194	20,238	193	3,226,367	26,066	*1	*320,322	.....
South Carolina...	304	15,904	479	436,882	99	386,615	3,305	44	895,064	7,342	.....	.....	.....
Mississippi.....	176	18,318	22	152,164	30	1,524,024	12,694	8	1,413,219	11,352	.....	.....	.....
Alabama.....	3,746	83,428	14	166,009	177	2,333,231	19,415	6	2,672,438	32,871	.....	.....	.....
Arkansas.....	.....	18	41	72,008	.....	.....	.....	0	44,819	460	.....	.....	.....
North Carolina...	.....	704	15	33,888	.....	.....	.....	.....	1,957	.....	.....	.....	.....
Tennessee.....	112	.....	640	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*1905-06.

which, though slow in materialization, ultimately resulted in the introduction of improved methods of cultivation, manufacture and marketing.

The Sugar Cane Belt

Our southern coastal states represent the northern limit of the productive cane belt in the new world. Cane is a native of the tropics, and though it has a wide geographic range north and south of the equator, its requirements are so imperative and specific as to delimit the area of profitable cultivation. The following may be enumerated as the more essential requisites: a seven to nine months' growing season of warm days and prevailing warm nights; a rainfall or irrigation supply amounting to thirty to fifty inches during the growing season; and a comparatively dry autumn for the maturing stage and the harvesting season. These conditions are usually supplied by eastern South Carolina, eastern and southern Georgia, Florida, Louisiana, southern Alabama, and southern and eastern Texas. It is estimated by the Louisiana Experimental Station that Louisiana contains at least 10,000,000 acres adapted to the profitable cultivation of cane. The crop thrives best on fertile alluvial loams which contain large quantities of decayed vegetable matter. These soils are also very productive of rice, cotton, and vegetables, and the profits from these products are increasing each year. The cultivation of cane on a commercial scale for the manufacture of sugar is confined to Louisiana and Texas, although small quantities of cane sugar are manufactured in Florida, Georgia, and South Carolina.

LOUISIANA.—Louisiana has naturally taken the lead in experimental work, being the only state in which the crop was a conspicuous source of wealth. The results have been gratifying, not only in largely supplanting the old crude and wasteful methods in vogue in the state, but in the educational value which is shared to a greater or less degree by the cane-growing countries of the world. With the placing of the industry on a more economical basis of operation has come a reduction in the number of plants. In 1850 there were 1,490 sugar houses in operation in the state for the manufacture of 154,000 tons of sugar; as compared with 200 factories in 1908, which produced 335,000 tons of sugar. Additional products from the 1908 crop were 540,581 barrels (fifty gallons)

of molasses, and 36,532 barrels of syrup. Louisiana reports a total of 4,730,148 acres in cultivation, of which 401,461 acres are in cane; as compared with 1,845,330 acres in cotton, 1,537,135 acres in corn, and 373,866 acres in rice, which are the most important competing crops with sugar cane.

The delta parishes situated west of New Orleans constitute the intensive cane belt of Louisiana, and in the northern half of the state but little cane is grown. St. Mary's Parish leads with 85,577 acres; Iberia is second, 40,000 acres; Assumption, third, 35,655 acres; and Lafourche, fourth, 33,000 acres. It is interesting to observe that Calcasieu, the parish which has more than one-third of the total rice acreage, has only 480 acres in cane cultivation.

The refining industry is now being established at New Orleans on a large scale, which should result in placing the raw sugar market on a more stable basis. One of the largest refineries in the country has just been completed by the American Sugar Refining Company, designed not only for handling the domestic supply, but also for the sugar imported from Cuba, Mexico and South America.

TEXAS.—The cane sugar industry has fluctuated more in Texas than in any other state, but the past decade has been a period of phenomenal and unprecedented development, the output having increased from 1,394 tons in 1899 to 12,000 tons in 1908. The lower valley of the Brazos River is the region in which cultivation is being concentrated, with Fort Bend County as the largest producer. The season in Texas is of sufficient length to mature and harvest cane in a coastal belt from seventy-five to one hundred miles in width. More varied economic conditions are operative in this coastal region than elsewhere. Rice, which twenty years ago was only grown experimentally, has become one of the largest crops of the Sabine Valley. Although the coast region is not the intensive cotton belt, cotton is cultivated in all of the coastal counties; and as Texas has increased her cotton production more rapidly than any other state, this part of the state has felt the vigor of the cotton exploiting. The rapid increase in the city population has also had significant influence on the production, particularly of vegetables and small fruits, for which this part of Texas is so well suited. The shipping facilities have been improved and enlarged simultaneously, making possible a diversified production which formerly would have been unprofitable. In the light of these facts and prospects, the continued increase in the cane production of Texas is by no means assured.

FLORIDA.—Cane is cultivated in all parts of Florida in small areas, aggregating 7,307 acres, but is utilized only for the manufacture of syrup. The sugar content is two to four per cent higher than in the Louisiana cane. The failure to develop the sugar cane industry on a commercial scale is because the soil and climate of the southern half of the state are so well adapted to the profitable production of early fruits and vegetables; while the climate and soil of the northern counties are equally well adapted to cotton, corn and peanuts. The latter demand less operating capital, and involve fewer labor complications.

ALABAMA.—That part of Alabama south of the thirty-second parallel has an average annual temperature of sixty-five degrees, and a growing season of not less than seven months. All fertile soils in this belt yield a luxuriant crop of sugar cane, and because of the prevailingly better drainage conditions than exist in the Mississippi delta region, it gives a higher average percentage of sugar. Although cane is not cultivated in the state for the commercial manufacture of sugar—the total output being less than ten tons—more than thirty thousand acres are utilized for the manufacture of syrup. The acreage is widely distributed, the purpose of the crop being chiefly to supply the domestic demand.

SOUTH CAROLINA.—The sugar cane industry has declined in South Carolina, as evidenced by the figures of Table I. The counties bordering the lower Savannah—Hampton, Boonwell and Aiken—are adapted in soil and climatic conditions to the production of cane comparable to the best in Louisiana both in tonnage and sugar yield. Cotton and rice are the cane-supplanting crops in this region, and economically so, because of the rise in the price of these commodities during the past two decades, while sugar has in general declined.

From Field to Factory

Planting.—Both autumn and spring planting are practiced in the South. On large plantations it begins in September, and is continued until the harvesting season of November and December, following which the harvested area will be planted as soon as practicable. Spring planting begins in early March and continues into April. Propagation is effected by covering the stubble, and by planting cane stalks selected and reserved for the purpose.

Seedling canes have been introduced for experimentation, but have not passed beyond this stage.

Cultivation.—The early cultivation is the most important, the most tedious, and the most expensive. Neglect at this stage means disaster, cane being a weak competitor with weeds in a free-handed fight. Since the extermination of weeds is the chief aim, the cultivations are shallow and frequent, and much of the labor must be done by the hand and hoe. The soil moisture is at the same time conserved for the larger demands in prospect. The next stage follows thinning, when the cane begins to reveal its identity as a giant of the grass family. Deeper plowing is effected by disc cultivators, which admit a deeper ventilation, and are so set as to throw the soil to the cane row. The latter is important not only to cover the weeds in the cane row, but to facilitate drainage and give the cane a deeper rooting. The crop should have the last cultivation from the first to the fifteenth of July. When cultivation is discontinued the growth is rapid, if the season is favorable. The length of the growing season is determined by the climatic conditions, the time of planting, the variety of cane, and the amount of space allotted to each parent stalk. August and September are the important maturing months in the United States. During this period the canals used for conveying the nutrition charged waters from the roots to the leaves become less active, and the sieve tubes which convey the nutrition from the leaves downward to the stalks become more active. A dry season is favorable during the last stages of maturing, as a part of the water contained in the plant is consumed to meet the deficiency of soil moisture, which leaves the sap correspondingly richer in sugar. As the plant approaches maturity, the joints change from a green to some shade of red, and the stalks begin to shed their leaves from the bottom. In the Gulf states the crop is not ready for harvesting until four to six weeks after the beginning of the change in color.

Harvesting.—Although the harvesting begins in October on the large plantations, because of the time required for harvesting and the apprehension of unfavorable weather, it is not in the best condition until November. The cutting is done almost exclusively by hand, since no satisfactory machine for harvesting cane has yet been invented. A strong laborer can cut and handle no more than three to four tons per day, which obviously makes a heavy demand for labor

during this season. The transportation of the cane from the field to the mill or factory presents many difficulties to the large grower because of the tonnage to be handled, and to the small grower because of the distance involved. The cane is conveyed from the field almost entirely by wagons, which are in general loaded by hand. Derrick hoists and gasoline power loaders are being introduced on a few plantations. The unloading at the mill was formerly done by hand, but in all of the large plants the cane is handled by machinery from the loaded wagons or carts to the mill.

Cost of Production

This naturally varies for different years, and in different localities for the same year. The reserve of seed cane represents a heavy initial cost, since a minimum of three tons per acre is required, or about one-fifth of the average crop. This could be milled at less cost than the "windrowing" for winter preservation, so at present mill prices it represents an outlay of twelve to sixteen dollars. In 1899, 3,870 farms in Louisiana, on which cane was the chief source of income, reported that the expenditures for labor and fertilizer amounted to forty-five per cent of the gross income. On the liberal estimate of sixteen tons per acre and four dollars per ton, the average cost of the labor and fertilizer was \$28.80 per acre, leaving \$35.20 to cover cost of seeding, risks, rental or interest charges, repairs, horse power and profits. The risk from storm losses is great, since the cane belt is in the zone of our most violent coastal storms. The total loss to the sugar cane crop of Louisiana from the storm of September 20, 1909, is estimated at 2.89 per cent (\$650,000) by Professor H. P. Agee, of the State Experimental Station. The losses in the Mississippi and Yazoo delta districts varied from ten to twenty per cent, and in Texas from eleven to twenty-five per cent. The shallow rooting of cane and the weight and brittleness of the stalk make destructive not only windstorms but heavy or continued rains.

The cost of labor has so increased during the past two decades that the industry would have declined but for the economies inaugurated in the different stages of production. From 1890 to 1900 the cost of unskilled farm labor in the cane-growing states increased from twenty to thirty per cent, while the price of granulated sugar declined from 6.3 per pound (1890) to 5.3 cents. From 1900 to

1909 wages increased more than twenty per cent, and granulated sugar declined from 5.3 cents per pound to 4.68. According to the statement of conservative planters the cost of producing raw cane sugar somewhat exceeds two and one-half cents per pound, and under the present economic conditions a reasonable profit cannot be realized unless the factory price averages two and one-half to three and one-half cents per pound for the different grades of raw sugar. The cost of factory equipment is estimated at \$250 for each ton of cane which can be milled per day; that is, a factory of 2,000 tons daily capacity would cost \$500,000.

Improvements

The progress in efficiency of manufacture has been more pronounced than in method of cultivation. When the application of the steam, vacuum-pan process was first introduced in 1845, fifty pounds of raw sugar was an average yield from a ton of cane, as compared with 165 pounds per ton from a well-equipped factory to-day. The old "open kettle" is an heirloom of a generation and economic period passed, but surviving to the extent to link it with the present. There has been a general improvement in the preparation of the land for the crop. This has come under the pressure of necessity and intelligent guidance. The state experimental stations of the cane-growing states have been active in their investigations, and co-operatively helpful in their results. The adaptation and application of fertilizers and the relative merits of cane varieties are the research lines which have been pursued with greatest assiduity. With the acquirement of more complete laboratory equipment the technical problems of manufacturing processes and by-product utilization are now being investigated by trained scientists and expert operatives.

The necessity of the situation in the exhaustion of soil fertility and the accompanying decrease in the yield helped the planter to the response of a listening ear and a willing hand. Much has also been accomplished in the way of reclamation by drainage and intensification by irrigation. Much more remains to be done. The lands in the southern coast region have not been developed to a market value which inspires extensive reclamation of the most approved permanent type. The most encouraging hope is that the federal government will take the initiative which has been shown in the reclamation service in the arid West.

The cane belt has no greater need than the general introduction and practice of diversified agriculture, or the judicious rotation of crops. As astounding and unnatural as it may seem, the one crop system is still in vogue, not only in a large part of the cane belt but also in the cotton growing regions. We can take courage since diversified production has gained ground more rapidly during the past five years. Intelligence, decrease in the "one crop" yield, and misfortune are driving the issue. The delta planters stood unmoved until the sixty per cent cane crop of 1898, and the subsequent arrival of the boll weevil. One planter in the Yazoo delta writes that the boll weevil did not strike him until last year, but succeeded in reducing his cotton crop from \$35,000 to \$11,000; and that, as a result, he has under cultivation this year thirty acres of cotton, compared with 700 last year, three hundred acres of corn and fifty acres of broom corn.

The adoption of diversified agriculture will have the effect of decentralizing the sugar-cane industry, of increasing the acreage yield, and of so fostering home industries—agricultural and manufacturing—as to lessen the risks and ameliorate the losses from adverse weather conditions, insect blight, and market depressions.

The pioneer stage of most industries has been noted for crudeness of methods and waste of products or by-products. The sugar industry is no exception. The low grade molasses, which is a by-product from sugar manufacture, was considered almost worthless, and in consequence was either discarded or sold at a very low price. It contains about fifty per cent of sugar, but also impurities which make the taste objectionable to man. Although the mules sometimes had to be driven from the vats, the value of low grade molasses as a stock food was not commercially recognized in the United States until recent years. Now it is prepared in a variety of mixtures, and is worth on the market \$20.00 per ton. The part fed in the South is usually mixed with cotton-seed meal, or oil cake, and cut forage—either hay, corn fodder, or sorghum.

Competition

Within the memory of many cane growers and sugar makers still living, sugar cane was king in the sugar realm. Only twenty years ago cane sugar constituted two-thirds of the world supply, while now it is a little less than one-half. Cane still supplies ninety

per cent of the sugar consumed in the United States, since ninety-three per cent of the sugar import is from cane-growing countries, and the United States imports approximately four-fifths of all sugar consumed. Excepting the crop of British India and China, we consume sixty per cent of the world's sugar manufactured from cane.

The nature of the competition to which the domestic cane sugar crop must adjust itself is somewhat complicated. The economic competition within the belt has been mentioned, and this is destined to become more exacting in its demands, proportionate to the development of diversified industries. The competition of the cane sugar production in Cuba, Hawaii and the Philippines is vigorous, both on account of the production and the dissimilar economic conditions which prevail in those countries. Herein lies the most commanding price fixing power, which is further augmented by the sugar trusts—the price manipulators. Since the wage scale is rising in each of these countries as rapidly as in the United States, there seems to be no reason for alarm, lest this competition should assume a prohibitory character. Almost one-half of the total sugar import in the United States is from Cuba. Since sugar can be produced there at a cost of two cents per pound, it is probable that our cane sugar production would be materially influenced, were sugar admitted duty free.

The competition with domestic beet sugar is not so close as with the tropical producing countries, and the tariff on refined sugar practically eliminates competition with the sugar beet countries of Europe. The cost of unskilled labor in the important beet growing states is somewhat higher than in the cane growing states, but there is little difference in the final cost of producing refined sugar from the two sugar plants. The sugar yield from one ton of beets varies from 270 pounds in California to 200 pounds in Kansas, Nebraska, Minnesota and Montana; and the average acreage yield of beets varies from ten tons in Colorado to six tons in Illinois. The average acreage yield of cane is about sixteen tons, which produce an average of 160 pounds of sugar per ton. From these figures it is obvious that the excess tonnage of cane is about balanced by the excess sugar content extractible from beets. The following reasons lead us to the conclusion that the progress of the sugar cane industry in the humid Southern States will not be

repressed by the beet sugar industry, which is confined largely to the arid and semi-arid states: First, the price of land under irrigation is increasing rapidly; second, diversified farming is being rapidly introduced on economic lines productive of the largest profits; and third, the increased demand for a larger number and more efficient laborers is steadily raising the scale of wages, which is already forty per cent higher than in the cane-growing states.